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Case report

Combined Spinal Anesthesia and Peripheral Nerve Block in a Patient with Severe Aortic Valve Stenosis and Reduced LVEF Undergoing Femur Fracture Repair

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Background: Patients with severe aortic stenosis (AS) and reduced left ventricular ejection fraction (LVEF) are at exceptionally high risk for perioperative complications, including heart failure and hemodynamic collapse. This case report describes the anesthetic management of a 79-year-old male with severe AS (aortic valve area 0.6 cm²), LVEF 30%, and pulmonary hypertension (PAP 40 mmHg) who was scheduled for right intertrochanteric femur fracture repair. The main challenge was to select an anesthesia plan that preserved hemodynamic stability while providing adequate analgesia for the surgery. We successfully administered a combination of low-dose spinal anesthesia using bupivacaine and a peripheral nerve block, minimizing hemodynamic disturbances while ensuring effective analgesia. This experience demonstrates that combining peripheral nerve block with low-dose neuraxial anesthesia can provide sufficient analgesia for lower limb surgery without compromising hemodynamics. Such an approach may encourage anesthesiologists to safely manage high-risk AS patients, enabling timely surgical intervention and recovery

Keywords: Peripheral nerve block, Spinal Anesthesia, Severe AS, Case report

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Introduction

Aortic stenosis (AS) is the most common valvular heart disease in developed countries, and its prevalence increases with age 1, 2). Each year, over 300,000 patients aged 65 and older are hospitalized for proximal femur fractures, many of whom concurrently have AS 3). A normal aortic valve area ranges from 3–4 cm², whereas a valve area <1.0 cm² is classified as

severe aortic stenosis (SAS). The main clinical manifestations of SAS include exertional angina, heart failure, presyncope, or syncope. Patients often experience exertional dyspnea due to elevated left ventricular filling pressures or an impaired ability to augment cardiac output during activity 4).

Severe aortic stenosis (SAS) in patients with left ventricular systolic dysfunction (LVEF <50%) significantly increases perioperative risk, as the fixed cardiac output can precipitate hemodynamic collapse 5, 6). These patients are also prone to hypotensive episodes and myocardial ischemia 7, 8), and pulmonary edema may occur due to fluid shifts 9, 10). Femur fractures in this population require urgent surgical fixation but present major anesthetic challenges. According to the American Heart Association (AHA) and American College of Cardiology (ACC) guidelines 11), SAS is the greatest risk factor in non-cardiac surgery 12). Conversely, delaying surgery leaves patients bedridden, increasing the risk of physical and psychiatric complications associated with immobility. Our challenge was to select an anesthetic approach that provided adequate analgesia while maintaining stable hemodynamics in this high-risk patient.

Historically, neuraxial anesthesia has been considered contraindicated in patients with aortic stenosis (AS) due to its sympatholytic effects, which reduce vascular resistance and can decrease cardiac output and organ perfusion. Similarly, general anesthesia with intravenous or volatile agents may lead to arrhythmias, myocardial depression, and heart failure. In high-risk cardiac patients, general anesthesia is also associated with increased respiratory complications and higher 30-day mortality compared to neuraxial techniques 13).

Nevertheless, regional anesthesia offers potential advantages in this population, as it avoids myocardial depression from volatile agents 14, 15), minimizes blood pressure fluctuations 16), and reduces opioid requirements through its analgesic effect. Here, we present a case in which combined spinal anesthesia and a peripheral nerve block were used successfully in a patient with severe AS and reduced LVEF undergoing femur fracture repair.

Case presentation

A 79-year-old male patient was scheduled for elective orthopedic surgery. He had a known history of severe aortic stenosis (AS) and, according to his most recent echocardiography, demonstrated left ventricular systolic dysfunction with an LVEF of 30%, at least moderate mitral regurgitation (MR), severe low-flow, low-gradient AS with an aortic valve area (AVA) of 0.6 cm^2 by continuity equation, and up to moderate tricuspid regurgitation (TR) with a pulmonary artery pressure of 40 mmHg. He also had chronic atrial fibrillation. The patient sustained a right femur fracture from a fall on a flat surface and was scheduled for open reduction and internal fixation (ORIF).

The patient's regular medications included losartan 25 mg, bisoprolol 2.5 mg, nitrocontin 2.6 mg, and rivaroxaban 2.5 mg twice daily. He also took aspirin 80 mg and furosemide 20 mg daily; aspirin was discontinued five days prior to surgery.

Radiological examination confirmed an intertrochanteric fracture of the right femur (Figure 1a). Preoperative laboratory studies revealed a hemoglobin level of 11.5 g/dL, platelet count of 168,000/mm^3, prothrombin time of 20 seconds, activated partial thromboplastin time of 52 seconds, and an INR of 2. Renal function tests showed a BUN of 33 mg/dL and creatinine of 1.6 mg/dL. Electrolytes were within normal limits, with a serum sodium of 135 mEq/L and potassium of 4.5 mEq/L.

Intraoperative management

After an 8-hour NPO period, the patient was brought to the operating room. The planned anesthetic approach was multimodal analgesia using low-dose spinal anesthesia combined with a peripheral nerve block. Following informed consent, standard monitoring was initiated, including non-invasive blood pressure (NIBP), pulse oximetry (SpO_2), heart rate (HR), and electrocardiography (ECG). Baseline vital signs were: blood pressure 115/75 mmHg, HR 84 bpm, respiratory rate 14 breaths/min, and SpO_2 96% on room air.

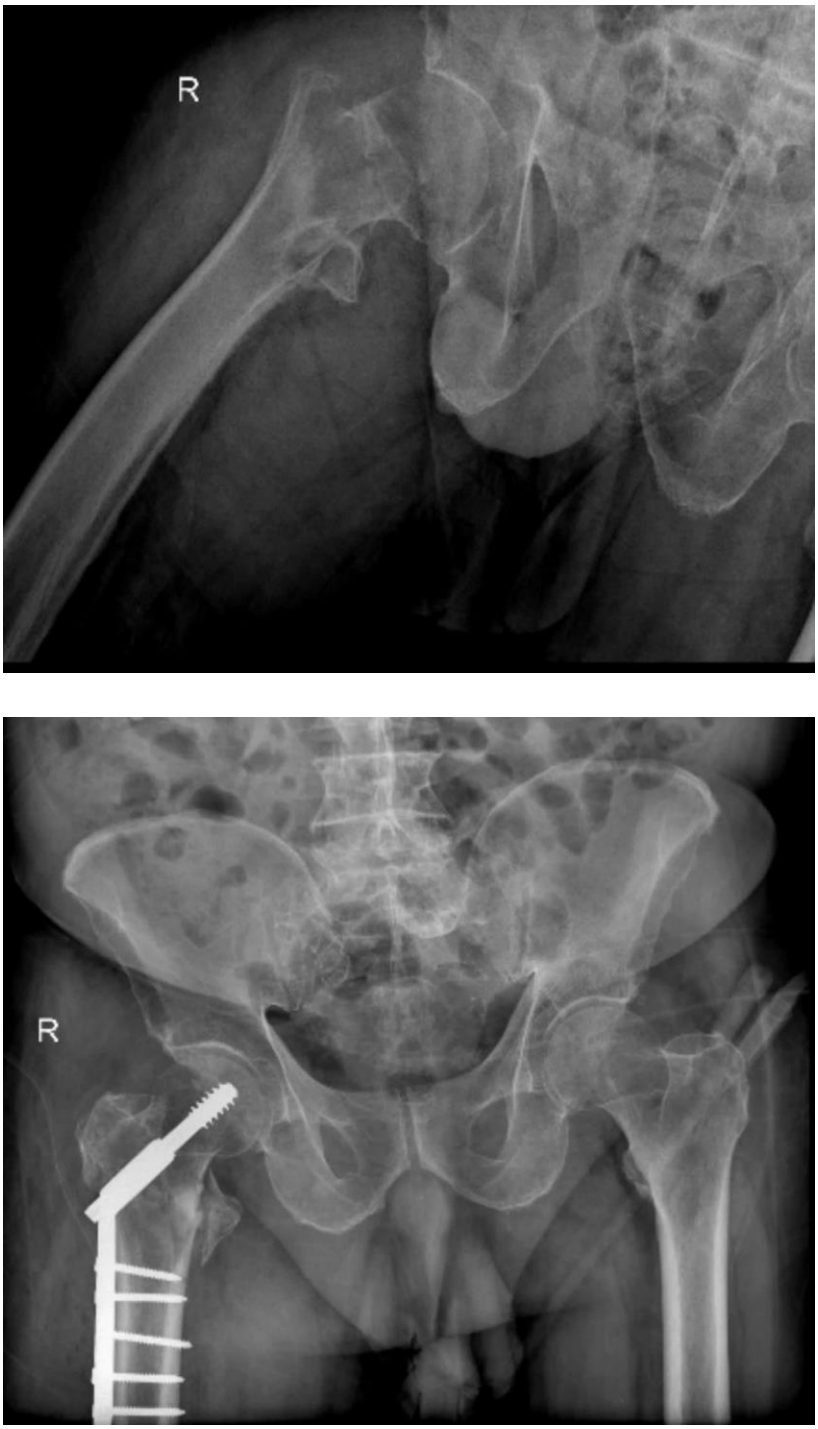

Fig.1. one. a. before and b. after surgical repair of the intertrochanteric fracture.

After sterile preparation and draping of the groin, the lateral cutaneous and peripheral nerves of the right thigh were blocked under ultrasound guidance using 3 mL of 0.25% bupivacaine. Approximately 10 minutes later, the peripheral block took effect. The patient was then assisted to a sitting position, and following sterile preparation of the lower back, a low-dose spinal injection of 5 mg bupivacaine combined with 25 µg fentanyl was administered at the L4–L5 interspace. The patient was positioned in the right lateral decubitus position to maximize the unilateral effect of the spinal anesthetic. Once a T10 sensory blockade was achieved,

surgery commenced with stable hemodynamics. Supplemental oxygen was administered at 4 L/min via face mask, and the patient was continuously monitored with ECG, NIBP, and pulse oximetry throughout the procedure.

The surgery lasted approximately two hours, during which adequate anesthesia was maintained without the need to convert to general anesthesia. Estimated blood loss was around 250 mL. The patient remained hemodynamically stable throughout the procedure, with no episodes of severe hypotension or bradycardia, and vasopressors such as phenylephrine were not required. No supplemental sedation was administered. Additionally, there were no signs of heart failure or respiratory compromise during the operation.

Intraoperatively, the patient's blood pressure ranged from 100/65 to 110/70 mmHg, and heart rate remained between 80 and 86 bpm. Following surgery, he was transferred to the post-anesthesia care unit (PACU), where he continued to be closely monitored. In the PACU, his hemodynamics remained stable: BP 110–115/70 mmHg, HR 84 bpm, RR 12 breaths/min, and SpO_2 99% on face mask, with effective pain control.

The patient was discharged three days postoperatively. At follow-up evaluations conducted one and three months after surgery, he was in good condition and had resumed his normal daily activities.

Discussion

The incidence of aortic valve stenosis (AS) due to degenerative calcification increases with age, and many elderly individuals may require non-cardiac surgery. According to current ACC and AHA guidelines, AS represents the most significant risk factor in non-cardiac surgical procedures 12).

The management of these patients is challenging due to both anesthetic and surgical stress. Severe aortic valve narrowing limits cardiac output, preventing it from increasing in response to heightened demands such as pain or hypotension 17). Additional factors, such as unexpected surgical bleeding, can further compromise hemodynamic stability. Hemodynamic instability may result in impaired coronary perfusion, myocardial injury, arrhythmias, ischemia, and even death 2).

When valvular repair surgery has not been performed and the patient requires non-cardiac surgery, selecting the optimal anesthetic plan is critical 14). General anesthetic agents often cause vasodilation and hypotension, while conventional neuraxial techniques can be hazardous due to sympathetic blockade and resultant systemic vasodilation. Conversely, drugs that increase heart rate and blood pressure should be minimized, as hypertension and tachycardia elevate myocardial oxygen consumption. In patients with severe aortic stenosis (SAS), who have impaired coronary perfusion and hypertrophied myocardium, this can readily precipitate myocardial ischemia. Effective pain management is therefore essential to prevent tachycardia. Additionally, general anesthesia in high-risk cardiac patients is associated with increased respiratory complications and higher 30-day mortality compared to neuraxial techniques 13).

Our patient was brought to the operating room for elective orthopedic surgery. He had known severe aortic stenosis (SAS) with systolic dysfunction, placing him at high risk for hemodynamic collapse. We elected to use a multimodal analgesic approach combining low-dose spinal anesthesia with a peripheral nerve block. The rationale was to achieve optimal analgesia and prevent tachycardia and hypertension from inadequate pain control, while minimizing drug exposure, reducing vasodilation, and maintaining stable hemodynamics.

The patient had discontinued aspirin five days prior to surgery; however, aspirin was not considered a contraindication to our neuraxial and regional anesthesia plan. For the peripheral nerve block, he received 3 mL of 0.25% bupivacaine to provide partial anesthesia of the surgical site and to ensure adequate analgesia when transitioning from supine to sitting for the spinal injection. This approach helped minimize the risk of tachycardia and exacerbation of heart failure. After administering low-dose spinal anesthesia, and to avoid excessive sympathectomy with potential bradycardia and hemodynamic compromise, the patient was positioned in the right lateral decubitus position to maximize the effect of the 5 mg bupivacaine on the

surgical site while minimizing vasodilatory cardiovascular effects.

Imré Van Herreweghe et al. reported that spinal anesthesia with ≤10 mg isobaric bupivacaine 0.5% without a peripheral nerve block in patients with moderate to severe AS resulted in systolic blood pressure <80 mmHg in 20% of patients and MAP <65 mmHg in 51%, requiring vasopressor intervention 18). Similarly, Errando et al. used 7.5 mg bupivacaine in elderly patients undergoing hip surgery; although none required rescue anesthesia, episodes of arterial hypotension were observed 20).

Our multimodal analgesic approach appeared to be more effective compared to some previously reported cases. In our patient, surgery lasted approximately two hours, during which adequate analgesia was maintained without the need to convert to general anesthesia, and he remained pain-free throughout his stay in the PACU. In contrast, Zeynep Cagiran et al. reported using unilateral low-dose hyperbaric bupivacaine (6.5–7.5 mg) in geriatric patients with moderate to severe aortic stenosis. Although their surgeries were mostly completed within one hour, the initial analgesic effect dissipated rapidly, with 64.4% of patients requiring additional analgesia within the first postoperative hour 19).

The patient was an elderly man with severe aortic stenosis (SAS) who had previously declined aortic valve repair and subsequently presented with a femoral fracture. His surgical plan was open reduction and internal fixation (ORIF), which is routinely performed under spinal anesthesia (SA).

In this case, both general anesthesia (GA) and conventional SA posed significant life-threatening risks. Furthermore, delaying surgery would have resulted in immobility-related complications, including physical issues such as venous thromboembolism and pressure ulcers, as well as psychological consequences like depression and anxiety. To mitigate these risks, we employed a combination of peripheral nerve block and low-dose spinal anesthesia.

This approach prevented pain-induced tachycardia and excessive cardiac workload during position changes, maintained stable hemodynamics with minimal sympathectomy, and provided effective intraoperative analgesia without the need for vasopressor support.

Conclusion

By combining a peripheral nerve block with low-dose spinal anesthesia, a patient who might otherwise have been unable to tolerate surgery due to advanced age and severe aortic stenosis successfully underwent orthopedic repair and returned to normal daily activities without experiencing complications related to untreated fracture. This experience may help reassure anesthesiologists that carefully planned regional anesthesia can be safely administered in similar high-risk patients.

Recommendation

This protocol should be considered for patients with aortic stenosis undergoing urgent orthopedic surgery, particularly those with concomitant systolic dysfunction.

Data Availability Statement

Data sharing is not applicable to this article, as no datasets were generated or analyzed during the current study.

Funding Statement

No funding was received for this case report.

Ethics Approval Statement

The study was approved by the Ethics Committee of Babol University of Medical Sciences, Iran (IR.MUBABOL. HRI. REC. 1403.020).

Patient Consent Statement

Written informed consent was obtained from the patient for publication of this report in accordance with the journal's patient consent policy.

Ethical Standards

This research was conducted in accordance with the principles of the 1975 Declaration of Helsinki, as revised in 2013 (http://ethics.iit.edu/ ecodes/ node/3931

Permission to Reproduce Material from Other Sources

All data supporting the results and findings of this study are included within the article.

References

1. Carabello BA, Paulus WJ. Aortic stenosis. The lancet. 2009;373(9667):956-66.

2. Herrera RA, Smith MM, Mauermann WJ, Nkomo VT, Luis SA. Perioperative management of aortic stenosis in patients undergoing non-cardiac surgery. Frontiers in Cardiovascular Medicine. 2023;10:1145290.

3. Cronin PK, Olson JJ, Harris MB, Weaver MJ. Severe aortic stenosis is associated with perioperative mortality in proximal femur fracture patients. OTA International. 2020 Jun 1; 3(2):e054.

4. San Román JA, Ybarra-Falcón C, García-Gómez M, Ramos N, Nombela L, Carnero M, Amat-Santos IJ, Sevilla T, Revilla A, Carrasco M, López-Díaz J. Evolution and prognostic significance of patient-reported symptoms after intervention in severe aortic stenosis. InMayo Clinic Proceedings 2024 Mar 1 (Vol. 99, No. 3, pp. 400-410). Elsevier.

5. Otto CM, Nishimura RA, Bonow RO, Carabello BA, Erwin III JP, Gentile F, Jneid H, Krieger EV, Mack M, McLeod C, O'Gara PT. 2020 ACC/AHA guideline for the management of patients with valvular heart disease: executive summary: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. Journal of the American College of Cardiology. 2021 Feb 2;77(4):450-500.

6. Park SJ, Enriquez-Sarano M, Chang SA, Choi JO, Lee SC, Park SW, Kim DK, Jeon ES, Oh JK. Hemodynamic patterns for symptomatic presentations of severe aortic stenosis. JACC: Cardiovascular Imaging. 2013 Feb;6(2):137-46.

7. Owens P, O'Brien E. Hypotension in patients with coronary disease: can profound hypotensive events cause myocardial ischaemic events?. Heart. 1999 Oct 1; 82(4):477-81.

8. Singh A, Antognini JF. Perioperative hypotension and myocardial ischemia: diagnostic and therapeutic approaches. Annals of cardiac anaesthesia. 2011 May 1; 14(2):127-32..

9. Zahid M, Sonel AF, Saba S, Good CB. Perioperative risk of noncardiac surgery associated with aortic stenosis. Am J Cardiol. 2005 Aug 1; 96(3):436-8.

10. MacIver DH, Clark AL. The vital role of the right ventricle in the pathogenesis of acute pulmonary edema. The American journal of cardiology. 2015 Apr 1; 115(7):992-1000.

11. Fleisher LA, Beckman JA, Brown KA, Calkins H, Chaikof E, Fleischmann KE, Freeman WK, Froehlich JB, Kasper EK, Kersten JR, Riegel B. ACC/AHA 2007 guidelines on perioperative cardiovascular evaluation and care for noncardiac surgery: executive summary: a report of the American college of cardiology/American heart association task force on practice guidelines (writing committee to revise the 2002 guidelines on perioperative cardiovascular evaluation for noncardiac surgery) developed in collaboration with the American society of echocardiography, American society of nuclear cardiology, heart rhythm society, society of cardiovascular .... Journal of the American College of Cardiology. 2007 Oct 23;50(17):1707-32.

12. Agarwal S, Rajamanickam A, Bajaj NS, Griffin BP, Catacutan T, Svensson LG, et al. Impact of aortic stenosis on postoperative outcomes after noncardiac surgeries. Circulation: Cardiovascular Quality and Outcomes. 2013;6(2):193-200.

13. Tai Y-H, Chang C-C, Yeh C-C, Cherng Y-G, Chen T-L, Liao C-C. Adverse outcomes after noncardiac surgery in patients with aortic stenosis. Scientific Reports. 2021; 11(1): 19517.

14. Fleisher LA, Fleischmann KE, Auerbach AD, Barnason SA, Beckman JA, Bozkurt B, Davila-Roman VG, Gerhard-Herman MD, Holly TA, Kane GC, Marine JE. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on practice guidelines. Journal of the American College of Cardiology. 2014 Dec 9; 64(22):e77-137.

15. Devereaux PJ, Biccard BM, Sigamani A, Xavier D, Chan MT, Srinathan SK, Walsh M, Abraham V, Pearse R, Wang CY, Sessler DI. Association of postoperative high-sensitivity troponin levels with myocardial injury and 30-day mortality among patients undergoing noncardiac surgery. Jama. 2017 Apr 25; 317(16):1642-51.

16. Kim YS, Park JH, Lee SY, Lim BG, Kim H, Lee IO, Kong MH. Combined spinal-epidural anesthesia for lumbar discectomy in a patient with asymptomatic severe aortic stenosis: a case report. Korean journal of anesthesiology. 2014 Aug 1; 67(2):129-32.

17. Samarendra P, Mangione MP. Aortic stenosis and perioperative risk with noncardiac surgery. Journal of the American College of Cardiology. 2015;65(3):295-302.

18. Van Herreweghe I, Cops J, Jacobs D, Polus F, Lopez A, Vandepitte C, Van Boxstael S, Hadzic A. EP011

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19. Çağıran Z, Vahabi A, Özgül KK, Aljasim O, Karaman S, Özkayın N, Aktuğlu K, Sertöz N. Unilateral Spinal Anesthesia in Hip Fracture Surgery for Geriatric Patients With High Cardiovascular Risk due to Aortic Stenosis is Safe and Effective. Geriatric orthopaedic surgery & rehabilitation. 2024 Aug 26; 15:21514593241280908.

20. Errando C, Peiró C, Gimeno A, Soriano J. Single shot spinal anesthesia with very low hyperbaric bupivacaine dose (3.75mg) for hip fracture repair surgery in the elderly. A randomized, double blinded study. Revista Española de Anestesiología y Reanimación. 2014 Nov; 61(9):481-8.